Prospective population based survey of outcome of pregnancy in diabetic women: results of the Northern Diabetic Pregnancy Audit, 1994

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Abstract

Objective: To determine whether the St Vincent declaration (1989) target of diabetic pregnancy outcome approximating non-diabetic pregnancy outcome is near to being achieved.
Design: Prospective collection of population based information on pregnancies in women with diabetes from all participating hospitals.
Setting: District general and teaching hospitals of the former Northern region.
Subjects: 111 diabetic women booking with pregnancy during 1 January to 31 December 1994.
Main outcome measures: Diabetic control, perinatal mortality rate, fetal abnormality rate.
Results: The perinatal mortality rate was 48/1000 for diabetic pregnancies compared with 8.9/1000 for the background population (odds ratio 5.38; 95% confidence interval 2.27 to 12.70) and the neonatal mortality rate was 59/1000 compared with 3.9/1000 (15.0; 6.77 to 33.10). Two late neonatal deaths were due to congenital heart defects. Six per cent of all fetal losses (6/109 cases) were due to major malformations. The congenital malformation rate was 83/1000 compared with 21.3/1000 (3.76; 2.00 to 7.06) in the background population.
Conclusion: Diabetic pregnancy remains a high risk state with perinatal mortality and fetal malformation rates much higher than in the background population.

Introduction

In 1989 the St Vincent declaration stated as a five year goal that the "outcome of diabetic pregnancy should approximate that of the non-diabetic pregnancy."[1] There are no prospective data from a large population base to determine whether this goal has been achieved. Within the former Northern region, data have been collected on perinatal mortality since 1982 and on fetal anomalies since 1984.[2-4] In 1993 it was agreed to prospectively collect population based information on the outcome of all diabetic pregnancies and to compare outcome with that of the background population. This report presents the outcome data for all pregnancies in diabetic women booked in 1994.

Method

All hospitals caring for diabetic pregnancy within the former Northern region participated. A steering group of diabetologists, obstetricians, and a neonatologist was formed and data collection from medical, obstetric, and neonatal notes agreed. Data were collected by an audit coordinator, who was notified when a woman with insulin dependent or non-insulin dependent diabetes mellitus booked at an antenatal clinic. The audit began in September 1993 and all sites were enrolled by December 1993. All diabetic pregnancies booked between 1 January and 31 December 1994 were notified. The last pregnancy notified proceeded to delivery in July 1995.

Data were analysed by SPSS. Odds ratios for incidences and their 95% confidence intervals were calculated by standard methods.[5] Background population data for 1994 were obtained from the collaborative perinatal mortality survey[2] and the regional fetal abnormality survey.[3]

Results

There were 113 booked pregnancies in 111 diabetic women (two women booked with two pregnancies in the same year); 105 women were treated with insulin before pregnancy. Figure 1 shows the glycated haemoglobin concentration (haemoglobin A_{1c}) plotted against the reference range for each hospital at booking (0-10 weeks' gestation) and in the second trimester (14-27^{+6} weeks). Several different assays for glycated haemoglobin were used by the hospitals (assay ranges were variable from 2.5-4.4% to 4.5-6.5%). Eight hospitals changed assay (and reference range) during the period of data collection. Seventy one of the 113 pregnancies were planned. Prepregnancy advice was given in 57 (80%) planned pregnancies. Despite this, however, measurements of diabetic control at booking in 59 women planning pregnancy showed values in only 17 (29%) cases to be within the reference range; moderate control was recorded in 29 (49%) cases and poor control in 13 (22%).

Thirty eight women went into spontaneous labour, 19 before term. The caesarean section rate was 62% (59 cases) compared with background rates of 10.4% to 17.5% among the hospitals. Twenty nine of the 113 pregnancies (26%; 95% confidence interval 17% to 34%) had an adverse fetal outcome. Table 1 shows the absolute numbers of fetuses of diabetic women and their outcomes in relation to the background population. One hundred pregnancies lasted for at least 24 weeks. Four were twin pregnancies, giving 104 fetuses. The perinatal mortality rate was 48/1000 compared with 8.9/1000 for non-diabetic births in 1994 (odds ratio 5.38; 2.27 to 12.70). The neonatal mortality rate was 59/1000 live births compared with 3.9/1000 (15.0; 6.77 to 33.10). A measure of global mortality is to account for all fetal losses from 20 weeks of gestation together with all postnatal deaths up to 1 year of age. The global loss rate was 111/1000 compared with a population average of 16/1000 (6.9; 4.0 to 11.8).

The congenital malformation rate was 9/109 fetuses (83/1000) compared with 21.3/1000 alive at

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BMJ 1997;315:279–81

Table 1 Outcome of diabetic pregnancies compared with pregnancies in background population, 1994

	Diabetic pregnancy	Northern region
Fetuses alive at 20 weeks	108	37 409
Fetal loss at 20-23 weeks	4	152
Registered births	104	37 257
Stillbirths	2	232
Early neonatal deaths	3	105
Late neonatal deaths	3	46
Postneonatal deaths	0	80

20 weeks in 1994 (3.76; 2.00 to 7.06). Confining the analysis to fetuses of over 24 weeks' gestation gave a rate of 5/104 or 48/1000 compared with a regional rate of 16.2/1000 (2.99; 1.26 to 7.05).

Thirty five per cent of babies (36/104) weighed above the 95th centile for babies born in the Northern region.[6] There was no systematic relation between the relative size of the babies and either death or serious congenital malformation. There were six live births and one stillbirth at less than 32 weeks of gestation. The odds ratio for live births at less than 32 weeks from diabetic pregnancies achieving viability was 6.2 (5.13 to 24.40). There was a substantial excess of premature births among diabetic pregnancies.

Discussion

We studied all pregnancies in diabetic women within a defined geographical region which was unbiased by differential referral or selective ascertainment. Global fetal and infant loss, perinatal mortality, neonatal mortality, and malformation rates were all significantly greater than those for the background population. Plainly the St Vincent declaration goal for pregnancy outcome was not being met in 1994.

The high fetal loss rate must be interpreted with caution, as the number of diabetic pregnancies remained small. However, a similar perinatal mortality rate and major malformation rate was reported a decade ago.[7] Diabetic pregnancies under close scrutiny may yield a high detection rate of fetal anomaly. The major congenital malformation rate for diabetic pregnancy was similar to that in previous reports.[8 9] Some authorities maintain there is no further scope for improving the outcome of diabetic pregnancy.[10]

Though two thirds of the pregnancies were planned by the mother, most women had not established good diabetic control before conception. Preconceptional care reduces major congenital malformations[7 8] and the spontaneous abortion rate.[11] It is essential that we should improve delivery of this cost effective care.[12]

A major difficulty was the lack of a standardised measure of diabetic control. Many different assays of glycated haemoglobin concentration are in use with different reference ranges. This is a serious problem for all audit in diabetes. For comparison we defined good diabetic control as a measure of haemoglobin A_{1c} concentration within the assay's reference range, moderate control as a haemoglobin A_{1c} concentration up to 8.5%, and poor control as a haemoglobin A_{1c} concentration exceeding 8.5%.[13 14]

The main finding of the Northern Diabetic Pregnancy Audit in 1994 was that one in four women with pregestational diabetes had a poor pregnancy outcome. Improvements in periconceptional care are recommended, though we recognise that other, unknown factors are related to the increased fetal malformation rate.

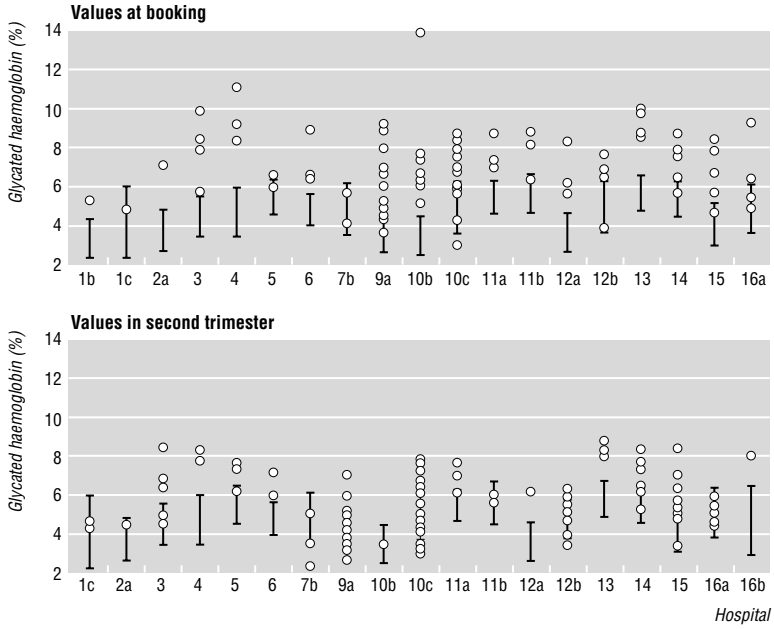

Fig 1 Glycated haemoglobin concentrations at booking and in second trimester. Bars are reference ranges for assay in each hospital. Points are values for each woman. Some hospitals used more than one assay (shown by a, b, c)

Key messages

- Though diabetic women who plan their pregnancies receive prepregnancy advice, most have poor diabetic control at conception
- In diabetic pregnancies the perinatal mortality rate is five times higher, the neonatal mortality rate 15 times higher, and the congenital malformation rate four times higher than in the background population
- There is a substantial excess of premature births in diabetic pregnancies
- The outcome of diabetic pregnancy remains poor; better uptake of preconceptional care may improve outcome

The Northern Diabetic Pregnancy Audit thanks the following link physicians, obstetricians, and paediatricians, without whose hard work none of this information would be available. Bishop Auckland Hospital NHS Trust: Dr A McCulloch, Mr J Foulds, Dr A Cottrell; Carlisle Hospitals NHS Trust: Dr D Large, Mr W Reid, Dr J Storr; Cheviot and Wansbeck NHS Trust: Dr E Young, Mr P Franks, Dr U Wariyar; Darlington Memorial Hospital Trust: Dr E Barnes, Mr J McDonald, Dr J Thakur; Gateshead Hospital Trust: Dr J Weaver, Mr M Das, Dr J Beesley; Hartlepool and East Durham NHS Trust: Mrs C Emmerson, Dr J Jani; North Durham Acute Hospitals NHS Trust: Dr E Sanders, Dr G Terry, Mr G E Anderson, Mr B Johnson, Dr A Speight, Dr B Thalayasingham; North Tees Hospital Trust: Dr D Carr, Mr N H Hattem, Dr I Verber; North Tyneside Trust: Mr D Evans, Dr W Houlsby; Royal Victoria Infirmary and Associated Hospitals NHS Trust: Dr R Dyer, Professor R Taylor, Professor J Davidson, Miss M Simms, Dr P Kenna; South Tees Acute Hospitals NHS Trust: Dr W Kelly, Mr R S Hutchison, Dr S Sinha; South Tyneside District: Dr J Parr, Mr A Jones, Dr M Massam; Sunderland City Hospital Trust: Dr B Chazan, Mr G McNab, Dr P Carter; West Cumbria Health Care Trust: Dr C Thompson, Mr S A Bober, Dr S Rich-

man. Special thanks are also due to all the diabetes nurse specialists and midwives who supplied information.

Funding: Northern and Yorkshire Supradistrict Purchasers Clinial Audit Group.

Conflict of interest: None.

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(Accepted 19 May 1997)

Long term effect of calcium supplementation during pregnancy on the blood pressure of offspring: follow up of a randomised controlled trial

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Abstract

Objective: To explore the long term effect of calcium supplementation during pregnancy on the offspring's blood pressure during childhood.

Design: Follow up of a population enrolled in a double blind, randomised, placebo controlled trial.

Setting: Perinatal research unit, World Health Organisation's collaborative research centre.

Subjects: 591 children at a mean age of 7 years whose mothers were randomly assigned during pregnancy to receive 2 g/day of elemental calcium (n = 298) or placebo (n = 293).

Main outcome measures: Mean blood pressure and rate of high blood pressure of children.

Results: Overall, systolic blood pressure was lower in the calcium group (mean difference − 1.4 mm Hg; 95% confidence interval − 3.2 to 0.5) than in the placebo group. The effect was found predominantly among children whose body mass index at assessment was above the median for this population (mean difference in systolic blood pressure − 5.8 mm Hg (− 9.8 mm Hg to − 1.7 mm Hg) for children with an index > 17.5 and − 3.2 mm Hg (− 6.3 mm Hg to − 0.1 mm Hg) for those with an index of > 15.7 to 17.5). The risk of high systolic blood pressure was also lower in the calcium group than in the placebo group (relative risk 0.59; 0.39 to 0.90) and particularly among children in the highest fourth of body mass index (0.43; 0.26 to 0.71).

Conclusion: Calcium supplementation during pregnancy is associated with lower systolic blood pressure in the offspring, particularly among overweight children.

Introduction

Impaired maternal nutritional state,[1] mother's diet,[2] and lower birth weight of the offspring[3] have been implicated in the development of hypertension later in life, suggesting that fetal life is a period for programming blood pressure. More specifically, the dietary calcium intake of pregnant women may be associated with the blood pressure of their infants,[4] and calcium intake is inversely correlated with systolic blood pressure in young children.[5]

Using the population of a large, multicentre, randomised, placebo controlled trial of the effect of calcium supplementation during pregnancy,[6] we explored the effect of calcium supplementation during pregnancy on the blood pressure of the women's children.

Materials and methods

The trial

A detailed description of the methodology of the original trial has been published.[6] In short, the trial examined the effectiveness of 2 g of elemental calcium supplementation a day (four tablets of calcium carbonate 500 mg) for the prevention of hypertensive disorders of pregnancy. Women were eligible for the study if they were nulliparous, had singleton pregnancies, and had blood pressure values below 140/90 mm Hg at the time of randomisation. Supplementation was started at 20 weeks' gestation and continued until delivery.

In all, 1194 pregnant women were enrolled in three public hospitals (580 women) and one private hospital

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BMJ 1997;315:281–5